

Stage 1 DBPR

DBP Precursors

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DBP Precursors

- Naturally found in water
- React with disinfectants to produce harmful DBPs
- Reduction of precursors limits DBPs



Treatment Technique (TT)

Applies only to Subpart H systems using conventional filtration or softening



Removal Percentages

Removal requirements depend on source water characteristics:

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L as CaCO ₃)		
	0-60	> 60-120	> 120
> 2.0 – 4.0	35.0%	25.0%	15.0%
> 4.0 – 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

Softening systems use these TOC removal requirements

Removal Percentages

- Source water samples determine TOC removal target
- Example:
 - Alkalinity = 65 mg/L
 - Source Water TOC = 9.0 mg/L
 - Required Removal Percentage = 40.0%

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Removal Percentages

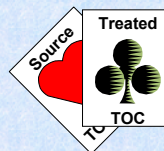
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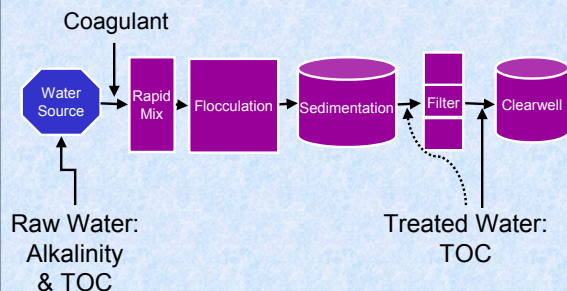
Routine Monitoring Requirements

1 sample set per month:

- Source water alkalinity
 - Source water TOC
 - Treated water TOC
- Paired sample



Example Monitoring Locations



Reduced Monitoring

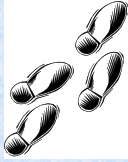
- Qualify if RAA of treated water TOC level is either:
 - Less than 2.0 mg/L for 2 years
 - OR
 - Less than 1.0 mg/L for 1 year
- Reduced Schedule:
 - 1 sample set (3 samples) per quarter
 - Return to routine if RAA of treated water TOC \geq 2.0 mg/L



DBP Precursor Compliance Overview

4 standard ways to comply:

1. Step 1 TOC removal
2. Alternative compliance criteria
3. Step 2 TOC removal
4. State waiver



Most systems will comply through alternative compliance criteria or Step 1 TOC removal

Alternative Criteria

- Ways to comply without removing specified % of TOC
- 6 alternatives
- 2 additional options for softening systems
- Must still collect routine 3-sample set

Alternative Criteria

1. RAA of monthly source water TOC samples < 2.0 mg/L
2. RAA of monthly treated water TOC samples < 2.0 mg/L



Alternative Criteria

3. RAA of source water TOC < 4.0 mg/L, RAA of source water alkalinity > 60 mg/L, and either:
 - TTHM RAA ≤ 0.040 mg/L and HAA5 RAA ≤ 0.030 mg/L
- OR
- System has made a "clear and irrevocable commitment" to install technology that limits TTHM/HAA5 to the specified levels

Alternative Criteria

4. TTHM RAA ≤ 0.040 mg/L and HAA5 RAA ≤ 0.030 mg/L, and the system only uses chlorine for primary disinfection and maintenance of a residual
5. RAA of SUVA prior to any treatment ≤ 2.0 L/mg-m
6. RAA of treated water SUVA ≤ 2.0 L/mg-m

Softening Alternative Criteria

Applicable only for softening systems:

7. Softening that results in an RAA of treated water alkalinity < 60 mg/L (as calcium carbonate)
8. Softening that results in an RAA for the removal of magnesium hardness (as calcium carbonate) of at least 10 mg/L

Alternative Criteria: Monitoring

Criterion	Additional Monitoring for Alternative Criteria
1	None (use routine raw water TOC sample)
2	None (use routine treated water TOC sample)
3	None (use routine raw water TOC, alkalinity and TTHM/HAA5 samples)
4	None (use routine TTHM/HAA5 samples)

Alternative Criteria: Monitoring

Criterion	Additional Monitoring for Alternative Criteria
5	Monthly source water SUVA (UV ₂₅₄ and dissolved organic carbon (DOC))
6	Monthly treated water SUVA (UV ₂₅₄ and DOC)
7	Monthly treated water alkalinity (as CaCO ₃)
8	Monthly source and treated water magnesium hardness (as CaCO ₃)

Alternative Criteria: Compliance

- In compliance if meeting the same alternative compliance criterion for 12 consecutive months
- No specific amount of TOC removal
 - Must still collect sample sets required for routine DBP precursor monitoring

Step 1 TOC Removal

- Source water samples determine a percentage of TOC that must be removed
- Percentage can change from month to month

Source Water TOC (mg/L)	Source Water Alkalinity (mg/L as CaCO ₃)		
	0-60	> 60-120	> 120
> 2.0 – 4.0	35.0%	25.0%	15.0%
> 4.0 – 8.0	45.0%	35.0%	25.0%
> 8.0	50.0%	40.0%	30.0%

Step 1 TOC Removal

- Source water samples determine a percentage of TOC that must be removed
- Percentage can change from month to month

January 2004	Source Water TOC (mg/L)	Source water alkalinity (mg/L as CaCO ₃)		
		0-60	80 mg/L	>120
	3.0 mg/L	35.0%	25.0%	15.0%
	> 4.0 – 8.0	45.0%	35.0%	25.0%
	> 8.0	50.0%	40.0%	30.0%

Step 1 TOC Removal

- Source water samples determine a percentage of TOC that must be removed
- Percentage can change from month to month

February 2004	Source Water TOC (mg/L)	Source water alkalinity (mg/L as CaCO ₃)		
		0-60	80 mg/L	>120
	> 2.0 – 4.0	35.0%	25.0%	15.0%
	4.5 mg/L	45.0%	35.0%	25.0%
	> 8.0	50.0%	40.0%	30.0%

Step 1 TOC Removal

- Compliance based on a ratio of the % of TOC actually removed to % of TOC that should have been removed
- RAA of ratios ≥ 1.00 required to remain in compliance (calculated quarterly)

Mixing and Matching

- Can use some alternative compliance criteria to comply with the Step 1 TOC removal requirements on a month-to-month basis
- Calculate RAA by using 1.0 for months when compliance is through an alternative criterion



Calculating Compliance

Example: Calculating removal ratio for a system using both alternative compliance criterion #1 and Step 1 removal ratios to comply

- Used alternative compliance criterion #1 in January and April (source water TOC < 2.0 mg/L)
- Used Step 1 removal ratios for remaining months

Step 1 Calculations: Example

Example: Calculating a Removal Ratio

Source Water Alkalinity	65 mg/L
Source Water TOC	9.0 mg/L
Required Removal Percentage	40.0%
Treated Water TOC	4.0 mg/L
TOC Removed (Source Water TOC - Treated Water TOC)	9.0 - 4.0 = 5.0 mg/L
Actual Removal Percentage (TOC removed/Source Water TOC)	5.0/9.0 = 0.556 (or 55.6%)
Calculation of Removal Ratio	55.6/40.0 = 1.39
Removal Ratio	1.39

Mixing and Matching: Calculations

Calculation	Calculate RAA	
	Use ratio of 1.0 for months during which system complied via alternative criteria	
	Compliance ratios for last 12 months:	
	September 2005: 1.12 August 2005: 1.53 July 2005: 1.48 June 2005: 0.71 May 2005: 0.72 April 2005: 1.0	March 2005: 0.63 February 2005: 1.17 January 2005: 1.0 December 2004: 1.36 November 2004: 1.35 October 2004: 0.44
	Sum of Monthly Averages = 12.51 RAA = 12.51/12 RAA = 1.04 \geq 1.00	
	System is in compliance	

Non-Compliance Actions

- Out of compliance if RAA of removal ratios is < 1.00 or an alternative compliance criterion is not met (for the year)
- Follow-up Actions:
 - State must be notified within 48 hours
 - Customers must be notified within 30 days
 - Copy of public notification must be sent to state within 10 days of notifying customers
 - Failure to do so would result in a Tier 2 PN violation
- Monitoring Violation: must notify state and customers

Step 2 TOC Removal

- Necessary if system cannot meet Step 1 or alternative criteria
- Include results of bench or pilot testing
- State sets alternative minimum TOC removal requirements
- Alternative requirements are called “Step 2”



DBP Precursor Compliance Reporting

DBP Precursors Compliance Reporting: Alternative Criterion

- Basic reporting requirements for all alternative compliance criteria (must be submitted quarterly):

Report Information:	
1.	The alternative compliance criterion used.
2.	The number of paired TOC samples taken during the last quarter.
3.	The location, date, and result of each paired TOC sample and associated alkalinity taken during the last quarter.
4.	Whether the system is in compliance with the particular alternative compliance criterion.

DBP Precursors Additional Requirements: Alternative Compliance Reporting

Criterion	Report Information:
1	RAA of source water TOC (based on monthly averages).
2	RAA of treated water TOC (based on monthly averages).
3	<ul style="list-style-type: none"> • RAA of source water TOC (based on monthly averages). • RAA of source water alkalinity (based on monthly averages). • RAA of TTHM and HAA5 (based on TTHM and HAA5 monitoring).

DBP Precursors Additional Requirements: Alternative Compliance Reporting

Criterion	Report Information:
4	RAA of TTHM and HAA5 (based on TTHM and HAA5 monitoring).
5	RAA of source water SUVA (based on monthly averages).
6	RAA of treated water SUVA (based on monthly averages).
7	RAA of treated water alkalinity.
8	RAA of amount of magnesium hardness removed (as CaCO ₃ in mg/L).
9	Whether the system is in compliance with the particular criterion (141.134(d)(1)(v)).

Step 1: DBP Precursors Compliance Reporting

- Reports must be submitted quarterly:

Report Information:	
1.	The number of paired (source water and treated water) TOC samples collected during the last quarter.
2.	The location, date, and results of each paired TOC sample and associated alkalinity taken during the last quarter.
3.	For each month in the reporting period that paired samples were taken, the arithmetic average of the percent reduction of TOC for each paired sample and the required TOC percent removal.

Step 1: DBP Precursors Compliance Reporting

Report Information:

4. Calculations for determining compliance with the TOC percent removal requirements.
5. Whether the system is in compliance with the enhanced coagulation or enhanced softening percent removal requirements for the last four quarters.